Timely Robust Fault Detection For Multirate Linear Systems

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Summary

This paper presents a fault detection and isolation scheme for multirate systems with a fast input sampling rate and slower output sampling rates. We design a separate observer for each set of simultaneous measurements with the observer operating at their sampling rate. We use an unknown input observer design to allow state estimation in the presence of disturbances and modelling errors. The observer allows us to estimate the system state and obtain a residual vector to be used in fault detection. Furthermore, we are able to use single-rate methodologies for fault diagnosis. We provide necessary and sufficient conditions for the existence of the observer and the detection of the fault vector. An example is given to illustrate the new fault detection approach and another to demonstrate fault isolation.

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